

Science Holds Pupfish in High Regard

by Dr. John M. Ward

President,
Desert Research Institute

"The pupfish of Death Valley region are extraordinary natural phenomena. If Charles Darwin had known of them, he would have been enthralled, for they are among the world's best examples of divergent evolution, as remarkable as the Galapagos finches which inspired him to form his theory of evolution."

That statement was recently made by Sterling Bunnell, an expert on the subject. It gives sharp focus to the underlying reason for the drive to save from extinction the little prehistoric finch-like pupfish.

live only in small pools in the Ash Meadows-Death Valley area — pools that will dry up completely if man continues to pump the ground water that supplies them. That threat has made the pupfish an endangered species, and has brought action by government authorities and scientific experts to halt the trend.

The Desert Research Institute, through its Center for Water Resources Research, has been working under a U.S. Dept. of Interior grant on the hydrology of the area, to find ways of developing water sources — agriculture, industry and residential supply — for the region's economy and still save the pupfish.

To do this job effectively, the DRI water experts have worked closely with the biological scientists at the University of Nevada, Las Vegas. Under the leadership of Dr. James Deacon, professor of biology at UNLV, the DRI hydrologists have been studying the history, habits, life styles and related characteristics of the pupfish.

Although there are pupfish in some three dozen ponds, those which live in Devil's Hole — the *Cyprinodon diabolis* — are of special scientific interest because they differ radically from other species. That is probably because they have been isolated in their steep-sided pool for a much longer time (at least 20,000 years, perhaps as many as 1 million).

What threatens them is the fact that breeding occurs only on a small ledge about three feet under water.

Pumping from nearby wells since 1967 has severely lowered that level; only

about 30 percent of the shelf is still under water. The belief is that if the water should get below the entire ledge, the Devil's Hole pupfish will become extinct — as other pupfish already have in nearby areas. (Their population is not great to start with. It ranges from a high of 800 in the summertime, when the sun is overhead, stimulating the growth of algae on which they mainly feed, to a low of about 200 in winter.)

Although they are believed to be a Pleistocene relic from a common ancestor, reaching back perhaps as much as 3 million years, their isolation has caused the Devil's Hole pupfish to develop characteristics in the course of their evolution which are strikingly different from those of their cousins in nearby pools. For instance, they lack the pelvic fins characteristic of other pupfish. And their nature is unique. The Devil's Hole pupfish are neither aggressive nor territorial, but other pupfish all establish and defend a breeding territory and take on all

challengers.

Dr. Deacon's group is experimenting now with an artificial "breeding shelf", to replace the natural one which already is almost 70 percent above water. Made of corrugated fiberglass, it rests on styrofoam floats in the center of the pool. But the only indication so far as to whether the shelf will work is that the fish have occupied it; there is no sign yet that they are using it for breeding purposes.

The other major try for saving Devil's Hole is the most important at the moment. The pumping was stopped last Sept. 9. It was hoped that this would bring about recovery, but so far, Dr. Deacon says "the water level has risen so little that it is not noticeable." He fears that this means that the water level will never again rise enough to cover more than half the shelf.

Attempts to transplant the fish have all failed. And Dr. Deacon takes a negative view of the idea anyway: "If we did transplant successfully, would we really have the same thing we have

now? The only way you can save the materials necessary for the study of evolution is to save the habitat. If you transplant the fish to another area, it is the equivalent of establishing a zoo. Change the habitat and you change other things."

The most important reason that scientists regard the pupfish as so vital to preserve is that its evolutionary process has somehow been speeded up so as to match the speed of change in environment. How this has happened is still not fully understood. But it causes the pupfish to offer a unique field of study of the evolutionary process.

As Sterling Bunnell puts it: "They represent one of the most striking examples of evolutionary change now to be found on our planet. Their research potential in genetics and evolutionary studies is enormous, and still scarcely touched."

Naturally DRI has a constant concern for all natural life. That concern must therefore involve research projects such as the fate of Nevada's unique pupfish.